

The documentation and process conversion measures necessary to comply with this document shall be completed by 14 November, 2001.

INCH-POUND

MIL-PRF-19500/355H
14 August 2001
SUPERSEDING
MIL-PRF-19500/355G
30 June 2000

PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, UNITIZED DUAL TRANSISTOR, NPN, SILICON
TYPES 2N2919, 2N2920, 2N2919L, 2N2920L, 2N2919U, AND 2N2920U,
JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

This specification is approved for use by all Departments
and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the performance requirements for two electrically isolated, matched NPN silicon transistors as one dual unit. Four levels of product assurance are provided for each device type as specified in MIL-PRF-19500. Two levels of product assurance are provided for die.

* 1.2 Physical dimensions. See figure 1 (similar to T0-78), figure 2 (surface mount), figure 3 (JANHCA and JANKCA die), figure 4 (JANHCB and JANKCB die).

1.3 Maximum ratings.

P _T (1) T _A = +25°C		P _T (2) T _C = +25°C		I _C	V _{CBO}	V _{CEO}	V _{EBO}	T _J and T _{STG}
One section	Both sections	One section	Both sections					
mW	mW	mW	W	mA dc	V dc	V dc	V dc	°C
300	600	750	1.25	30	70	60	6	-65 to +200

* (1) For T_A > +25°C, derate linearly 1.71 mW/°C, one section; 3.43 mW/°C, both sections.

* (2) For T_C > +25°C, derate linearly 4.286 mW/°C, one section; 7.14 mW/°C, both sections.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center, Columbus, ATTN: DSCC-VAC, P. O. Box 3990, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A
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FSC5961

1.4 Primary electrical characteristics of each individual section.

	h_{FE1}		$ h_{fe} $	$V_{CE(SAT)}$
	$V_{CE} = 5 \text{ V dc}$ $I_C = 10 \text{ } \mu\text{A dc}$		$V_{CE} = 5 \text{ V dc}$ $I_C = 0.5 \text{ mA dc}$ $f = 20 \text{ MHz}$	$I_C = 1 \text{ mA dc}$ $I_B = 100 \text{ } \mu\text{A dc}$
	2N2919 2N2919L 2N2919U	2N2920 2N2920L 2N2920U		
				<u>V dc</u>
Min	60	175	3.0	
Max	240	600	20	0.3

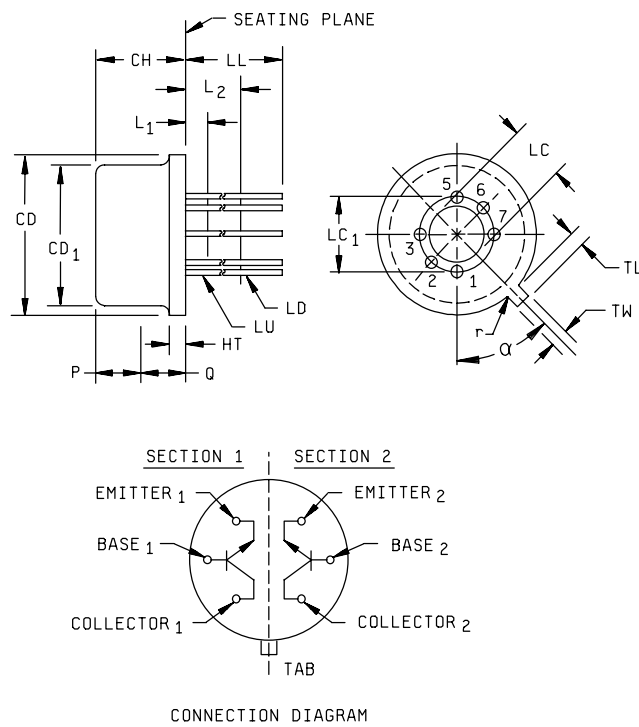
1.5 Primary electrical matching characteristics of each individual section.

	$\frac{h_{FE2-1}}{h_{FE2-2}}$	$ V_{BE1} - V_{BE2} _1$	$ \Delta(V_{BE1} - V_{BE2})_{\Delta T_A} _1$	$ \Delta(V_{BE1} - V_{BE2})_{\Delta T_A} _2$
	$V_{CE} = 5 \text{ V dc}$ $I_C = 100 \text{ } \mu\text{A dc}$ (1)	$V_{CE} = 5 \text{ V dc}$ $I_C = 10 \text{ } \mu\text{A dc}$	$V_{CE} = 5 \text{ V dc}$ $I_C = 100 \text{ } \mu\text{A dc}$ $T_A = +25^\circ\text{C and } -55^\circ\text{C}$	$V_{CE} = 5 \text{ V dc}$ $I_C = 100 \text{ } \mu\text{A dc}$ $T_A = +125^\circ\text{C and } +25^\circ\text{C}$
		<u>mV dc</u>	<u>mV dc</u>	<u>mV dc</u>
Min	0.9			
Max	1.0	5	0.8	1.0

(1) The larger number shall be placed in the denominator.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

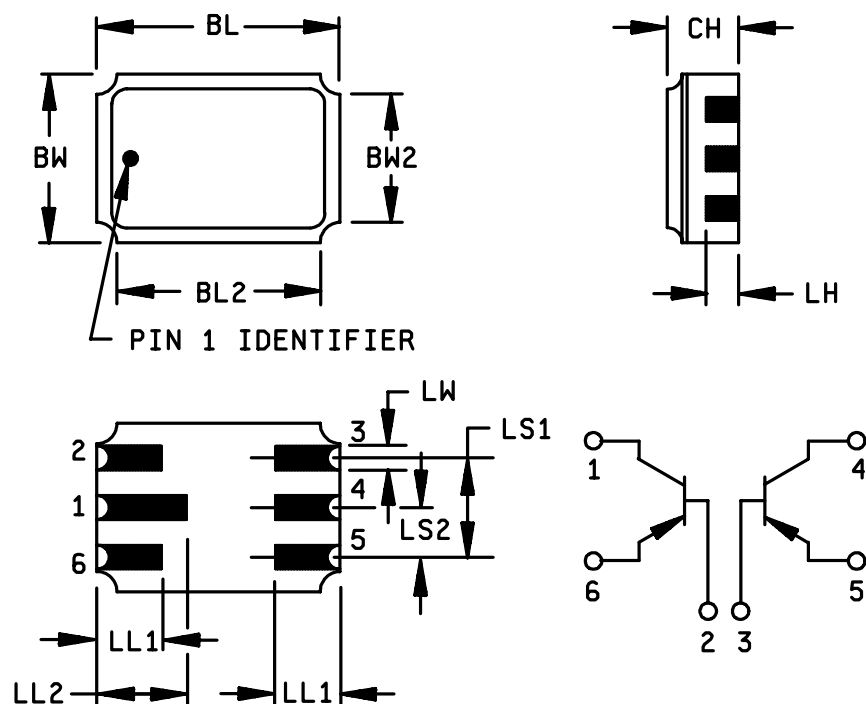


Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.335	.370	8.51	9.40	
CD ₁	.305	.335	7.75	8.51	
CH	.140	.260	3.56	6.60	
HT	.009	.041	0.23	1.04	
LC	.140	.160	3.56	4.06	
LC ₁	.200 TP		5.08 TP		9
LD	.016	.021	.041	0.53	10
LL	See notes 10, 11, and 12				
LU	.016	.019	0.41	0.48	10
L ₁		.050		1.27	10
L ₂	.250		6.35		10
P	.100		2.54		8
Q		.050		1.27	7
TL	.029	.045	0.74	1.14	5, 6
TW	.028	.034	0.71	0.86	4, 5
r		.010		1.27	
α	45°TP		45°TP		9

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Tab shown omitted.
4. Lead numbers 4 and 8 are omitted on this variation.
5. Beyond r maximum, TW shall be held to a minimum length of .21 inch (0.53 mm).
6. TL shall be measured from maximum CD.
7. Details of outline in this zone are optional.
8. CD₁ shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
9. Leads at gauge plane .054 - .055 inch (1.37 - 1.40 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at a maximum material condition (MMC) relative to the tab at MMC. The device may be measured by direct methods or by the gauge and gauging procedures described on gauge drawing GS-1.
10. LU applies between L₁ and L₂. LD applies between L₂ and LL minimum. Diameter is uncontrolled in L₁ and beyond LL minimum.
11. For transistor types 2N2919 and 2N2920, LL is .500 inch (12.70 mm) minimum and .750 inch (19.05 mm) maximum.
12. For transistor type 2N2919L and 2N2920L, LL is 1.500 inches (38.10 mm) minimum and 1.750 inches (44.45 mm) maximum.

FIGURE 1. Physical dimensions (2N2919, 2N2919L, 2N2920, and 2N2920L).



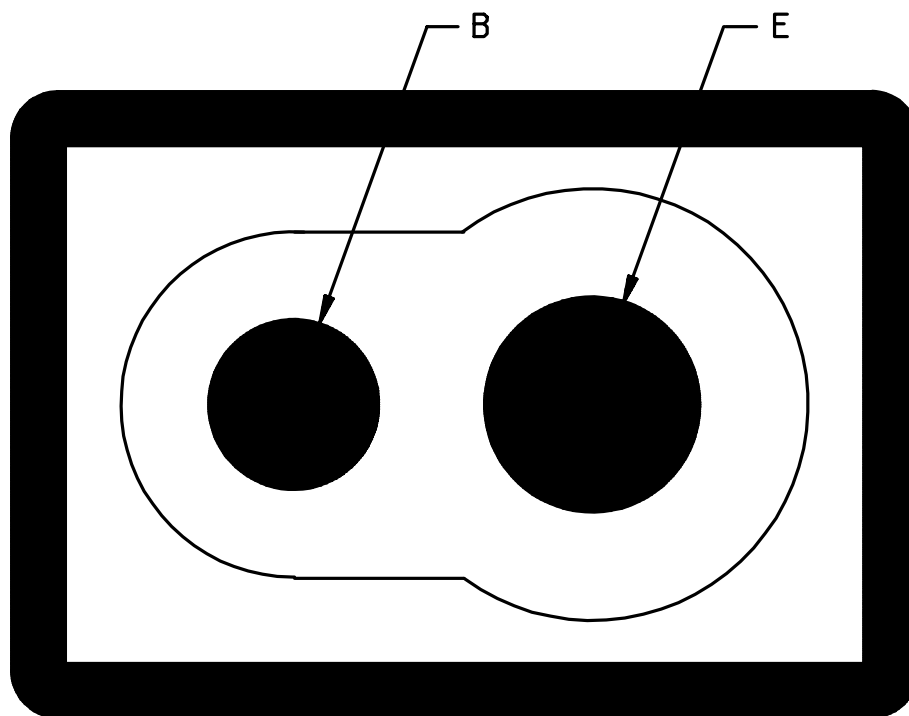
Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.240	.250	6.10	6.35
BL ₂		.250		6.35
BW	.165	.175	4.19	4.44
BW ₂		.175		4.44
CH	.044	.080	1.12	2.03
LH	..014	.034	0.36	0.86
LL ₁	.060	.070	1.52	1.78
LL ₂	.082	.098	2.08	2.49
LS ₁	.095	.105	1.14	2.67
LS ₂	.045	.055	1.14	1.39
LW	.022	.028	0.56	0.71

Pin no.	Transistor
1	Collector no. 1
2	Base no. 1
3	Base no. 2
4	Collector no. 2
5	Emitter no. 2
6	Emitter no. 1

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.

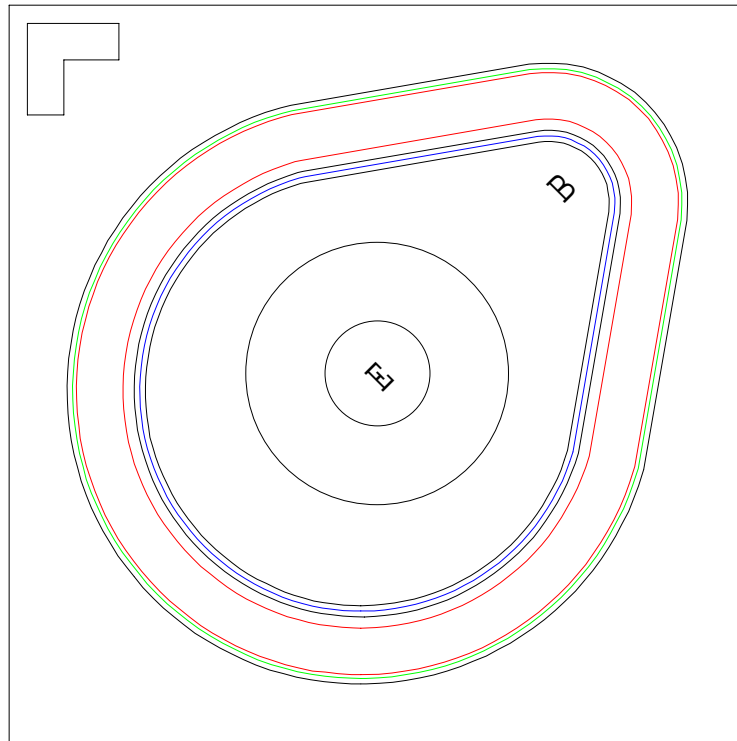
FIGURE 2. Physical dimensions (2N2919U and 2N2920U) surface mount.



NOTES:

1. Chip size015 x .019 inch \pm .001 inch (0.381 x 0.4826 mm \pm 0.0254 mm).
2. Chip thickness..... .010 \pm .0015 inch (0.254 \pm 0.0381 mm).
3. Top metal Aluminum 15,000Å minimum, 18,000Å nominal.
4. Back metal A. Gold 2,500Å minimum, 3,000Å nominal.
B. Eutectic Mount - No Gold.
5. Backside..... Collector.
6. Bonding pad B = .003 inch (0.0762 mm), E = .004 inch (0.1016 mm) diameter.
7. Passivation..... Si₃N₄ (Silicon Nitride) 2 kÅ min, 2.2 kÅ nom.

FIGURE 3. Physical dimensions (JANHCA and JANKCA die).



NOTES:

1. Die size----- .018 x .018 inch (0.457 mm x 0.457 mm).
2. Die thickness--- .008 ±.0016 inch (0.203 mm ±0.04 mm).
3. Base pad----- .0025 inch diameter (0.06 mm).
4. Emitter pad----- .003 inch diameter (0.076).
5. Back metal----- Gold, 6500 ±1950Å.
6. Top metal----- Aluminum, 19500 ±2500Å.
7. Back side----- Collector.
8. Glassivation--- SiO₂, 7500 ± 1500Å.

FIGURE 4. Physical dimensions (JANHCB and JANKCB) B version die.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

DEPARTMENT OF DEFENSE

MIL-PRF-19500 - Semiconductor Devices, General Specification for.

STANDARD

DEPARTMENT OF DEFENSE

MIL-STD-750 - Test Methods for Semiconductor Devices.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Services (DAPS), Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 General. The requirements for acquiring the product described herein shall consist of this document and MIL-PRF-19500.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list (QML) before contract award (see 4.2 and 6.3).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500 and as follows:

$\frac{h_{FE-1}}{h_{FE-2}}$	Static forward-current-gain-ratio. The matching ratio of the static forward-current transfer ratios of each section.
$ V_{BE1} - V_{BE2} $	Absolute value of base-emitter-voltage differential between the individual sections.
* $ \Delta V_{BE1-2}(T1) - \Delta V_{BE1-2}(T2) $	Absolute value of the algebraic difference between the base-emitter-voltage differentials between the individual sections at two different temperatures.

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500 and on figures 1, 2, 3, and 4.

3.4.1 Lead finish. Lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

3.5 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3.

3.6 Electrical test requirements. The electrical test requirements shall be group A as specified herein.

3.7 Marking. Marking shall be in accordance with MIL-PRF-19500.

3.8 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Screening (see 4.3)
- c. Conformance inspection (see 4.4).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

* 4.2.1 JANHC and JANKC die. Qualification shall be in accordance with MIL-PRF-19500

4.3 Screening (JANS, JANTXV, and JANTX levels only). Screening shall be in accordance with table IV of MIL-PRF-19500, and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
3c	Thermal impedance (see 4.3.2)	Thermal impedance (see 4.3.2)
9	I_{CBO2} , h_{FE3} , $\frac{h_{FE2-1}}{h_{FE2-2}}$	Not applicable
10	48 hours minimum	48 hours minimum
11	I_{CBO2} , h_{FE3} , $\frac{h_{FE2-1}}{h_{FE2-2}}$ ΔI_{CBO2} = 100 percent of initial value or 1 nA dc, whichever is greater. Δh_{FE3} = ± 20 percent.	I_{CBO2} , h_{FE3} , $\frac{h_{FE2-1}}{h_{FE2-2}}$
12	See 4.3.1 240 hours minimum	See 4.3.1 80 hours minimum
13	Subgroups 2 and 3 of table I herein; ΔI_{CBO2} = 100 percent of initial value or 1 nA dc, whichever is greater; Δh_{FE3} = ± 25 percent.	Subgroup 2 and the Base emitter voltage (nonsaturated) (absolute value of differential-change with temperature) tests of subgroup of table I herein; ΔI_{CBO2} = 100 percent of initial value or 1 nA dc, whichever is greater; Δh_{FE3} = ± 25 percent.

* 4.3.1 Power burn-in conditions. Power burn-in conditions are as follows: $V_{CB} = 10$ to 30 V dc; apply maximum rated P_D as defined in 1.3.

4.3.2 Thermal impedance ($Z_{\theta JX}$ measurements). The $Z_{\theta JX}$ measurements shall be performed in accordance with method 3131 of MIL-STD-750.

- * a. I_H forward heating current ----- 50 mA (min).
- b. t_H heating time ----- $25 - 30$ ms.
- c. I_M measurement current----- 5 mA.
- d. t_{md} measurement delay time ----- 60 μ s max.
- e. V_{CE} collector-emitter voltage ----- 10 V dc minimum.

The maximum limit for $Z_{\theta JX}$ under these test conditions are $Z_{\theta JX} (\text{max}) = 72^\circ\text{C/W}$.

* 4.3.3 Screening (JANHC and JANKC). Screening of JANHC and JANKC die shall be in accordance with method 3131 of MIL-PRF-19500, "Discrete Semiconductor Die/Chip Lot Acceptance". Burn-in duration for the JANKC level follows JANS requirements; the JANHC follows JANTX requirements.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500, and as specified herein. If alternate screening is being performed in accordance with MIL-PRF-19500, a sample of screened devices shall be submitted to and pass the requirements of group A1 and A2 inspection only (table VIb, group B, subgroup 1 is not required to be performed again if group B has already been satisfied in accordance with 4.4.2).

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500, and table I herein.

* 4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VIa (JANS) of MIL-PRF-19500 and 4.4.2.1 herein. Electrical measurements (end-points) and delta requirements shall be in accordance with group A, subgroup 2 and 4.5.8 herein. See 4.4.2.2 for JAN, JANTX, and JANTXV group B testing. Electrical measurements (end-points) and delta requirements for JAN, JANTX, and JANTXV shall be after each step in 4.4.2.2 and shall be in accordance with group A, subgroup 2 and 4.5.8 herein.

4.4.2.1 Group B inspection, table VIa (JANS) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B4	1037	$V_{CB} = 10$ V dc
B5	1027	$V_{CB} = 10$ V dc; $P_D \geq 75$ percent of maximum rated P_T (see 1.3). Option 1: 96 hrs min, sample size in accordance with table VIa of MIL-PRF-19500, adjust T_A to achieve $T_J = +275^\circ\text{C}$ minimum. Option 2: 216 hrs min., sample size = 45, $c = 0$; adjust T_A to achieve $T_J = +225^\circ\text{C}$ minimum. (NOTE: If a failure occurs, resubmission shall be at the test conditions of the original sample.)

4.4.2.2 Group B inspection, (JAN, JANTX, and JANTXV). 1/

<u>Step</u>	<u>Method</u>	<u>Condition</u>
1	1039	Steady-state life: Test condition B, 340 hours, $V_{CB} = 10$ to 30 V dc, $T_J = +150^\circ\text{C}$ min., external heating of the device under test to achieve $T_J = +150^\circ\text{C}$ minimum is allowed provided that a minimum of 75 percent of rated power is dissipated. No heat sink or forced-air cooling on the devices shall be permitted. $n = 45$ devices, $c = 0$
2	1039	The steady-state life test of step 1 shall be extended to 1,000 hours for each die design. Samples shall be selected from a wafer lot every twelve months of wafer production. Group B, step 2 shall not be required more than once for any single wafer lot. $n = 45$, $c = 0$.
3	1032	High-temperature life (non-operating), $t = 340$ hours, $T_A = +200^\circ\text{C}$. $n = 22$, $c = 0$.

4.4.2.3 Group B sample selection. Samples selected from group B inspection shall meet all of the following requirements:

- For JAN, JANTX, and JANTXV samples shall be selected randomly from a minimum of three wafers (or from each wafer in the lot) from each wafer lot. For JANS, samples shall be selected from each inspection lot. See MIL-PRF-19500.
- Must be chosen from an inspection lot that has been submitted to and passed group A, subgroup 2, conformance inspection. When the final lead finish is solder or any plating prone to oxidation at high temperature, the samples for life test (subgroups B4 and B5 for JANS, and group B for JAN, JANTX, and JANTXV) may be pulled prior to the application of final lead finish.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500, and in 4.4.3.1 (JANS).and 4.4.3.2 (JAN, JANTX, and JANTXV) herein for group C testing. Electrical measurements (end-points) and delta requirements shall be in accordance with group A, subgroup 2 and 4.5.8 herein.

4.4.3.1 Group C inspection, table VII (JANS) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Test condition E, not applicable to surface mount.
C6	1026	1,000 hours at $V_{CB} = 10 - 30$ V dc; $T_J = +150^\circ\text{C}$ minimum, external heating of the device under test to achieve $T_J = +150^\circ\text{C}$ minimum is allowed provided that a minimum of 75 percent of rated power is dissipated. No heat sink or forced-air cooling on device shall be permitted.

4.4.3.2 Group C inspection, table VII (JAN, JANTX, and JANTXV) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Test condition E, not applicable to surface mount.
C6		Not applicable.

1/ Separate samples may be used for each step. In the event of a group B failure, the manufacturer may pull a new sample at double size from either the failed assembly lot or from another assembly lot from the same wafer lot. If the new "assembly lot" option is exercised, the failed assembly lot shall be scrapped.

* 4.4.3.3 Group C sample selection. Samples for subgroups in group C shall be chosen at random from any inspection lot containing the intended package type and lead finish procured to the same specification which is submitted to and passes group A tests for conformance inspection. When the final lead finish is solder or any plating prone to oxidation at high temperature, the samples for C6 life test may be pulled prior to the application of final lead finish. Testing of a subgroup using a single device type enclosed in the intended package type shall be considered as complying with the requirements for that subgroup.

* 4.4.4 Group E inspection. Group E inspection shall be performed for qualification or re-qualification only. If not performed at the time of initial qualification, the tests specified in table II herein must be performed to maintain qualification.

4.5 Method of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

4.5.2 Testing of units. All specified electrical tests, including end-point tests, shall be performed equally on both sections of the transistor types covered herein, except where the electrical characteristic being evaluated applies to the transistor as a device entity.

4.5.3 Disposition of leads when testing characteristics of each section. During the measurement of the characteristics of each section, the leads of the section not under test shall be open-circuited.

4.5.4 Forward-current-gain ratio. The value for the forward-current-gain ratio for each individual section of a dual unit shall be measured using method 3076 of MIL-STD-750. The forward-current-gain ratio shall be calculated by dividing one of the values by the other. If possible, this ratio shall be measured directly to improve accuracy.

4.5.5 Base-emitter-voltage differential. The base-emitter-voltage differential shall be determined by connecting the emitters of the individual sections together, applying specified electrical test conditions to each individual section in accordance with method 3066 of MIL-STD-750, test condition B, and measuring the absolute value of the voltage between the bases of the individual sections of a dual unit.

4.5.6 Base-emitter-voltage differential change with temperature. The value of the base-emitter-voltage differential shall be measured at the two specified temperatures in accordance with 4.5.5 except that the polarities of the differentials and identities of the individual sections shall be maintained. The absolute value of the algebraic difference between the values at the two temperature extremes shall be calculated. A mathematical formula for this parameter is:

$$|(V_{BE1}(T_1) - V_{BE2}(T_1)) - (V_{BE1}(T_2) - V_{BE2}(T_2))|$$

4.5.7 Noise figure test. Noise figure shall be measured using a model no. 2173C/2181 Quan Tech Laboratories test set, or equivalent. Conditions shall be as specified in table I.

* 4.5.8 Delta requirements. Delta requirements shall be as specified below:

Step	Inspection	MIL-STD-750		Symbol	Limit		Unit
		Method	Conditions		Min	Max	
1	Collector-base cutoff current	3036	Bias condition D, $V_{CB} = 45 \text{ V dc}$	ΔI_{CBO2}	100 percent of initial value or 1 nA dc, whichever is greater.		
2	Forward current transfer ratio	3076	$V_{CE} = 5 \text{ V dc};$ $I_C = 1 \text{ mA dc};$ pulsed see 4.5.2	Δh_{FE3}	± 25 percent change from initial reading.		

TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1 2/</u>						
Visual and mechanical <u>3/</u> examination	2071	n = 45 devices, c = 0				
Solderability <u>3/ 4/</u>	2026	n = 15 leads, c = 0				
Resistance to solvents <u>3/ 4/ 5/</u>	1022	n = 15 devices, c = 0				
Temp cycling <u>3/ 4/</u>	1051	Test condition C, 25 cycles. n = 22 devices, c = 0				
Heremetic seal <u>4/</u> Fine leak Gross leak	1071	n = 22 devices, c = 0				
Electrical measurements, <u>4/</u>		Group A, subgroup 2				
Bond strength <u>3/ 4/</u>	2037	Precondition T _A = +250°C at t = 24 hrs or T _A = +300°C at t = 2 hrs n = 11 wires, c = 0				
<u>Subgroup 2</u>						
Collector to base cutoff current	3036	Bias condition D; V _{CB} = 70 V dc	I _{CBO1}		10	μA dc
Emitter to base cutoff current	3061	Bias condition D; V _{EB} = 6 V dc	I _{EBO1}		10	μA dc
Breakdown voltage, collector to emitter	3011	Bias condition D; I _C = 10 mA dc; pulsed (see 4.5.1)	V _{(BR)CEO}	60		V dc
Collector to base cutoff current	3036	Bias condition D; V _{CB} = 45 V dc	I _{CBO2}		2	nA dc
Collector to emitter cutoff current	3041	Bias condition D; V _{CE} = 5 V dc	I _{CEO1}		2	nA dc
Emitter to base cutoff current	3061	Bias condition D; V _{EB} = 5 V dc	I _{EBO2}		2	nA dc
Forward-current transfer ratio	3076	V _{CE} = 5 V dc; I _C = 10 μA dc	h _{FE1}			
2N2919, 2N2919L, 2N2919U 2N2920, 2N2920L, 2N2920U				60 175	240 600	
Forward-current transfer ratio	3076	V _{CE} = 5 V dc; I _C = 100 μA dc	h _{FE2}			
2N2919, 2N2919L, 2N2919U 2N2920, 2N2920L, 2N2920U				100 235	325 800	

See footnotes at end of table.

TABLE I. Group A inspection - Continued

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 2</u> - Continued						
Forward-current transfer ratio 2N2919, 2N2919L, 2N2919U 2N2920, 2N2920L, 2N2020U	3076	V _{CE} = 5 V dc; I _C = 1 mA dc;	h _{FE3}	150 300	600 1,000	
Base-emitter saturation voltage	3066	Test condition A; I _C = 1.0 mA dc; I _B = 100 μA dc;	V _{BE(sat)1}	0.5	1.0	V dc
Collector-emitter saturation voltage	3071	I _C = 1.0 mA dc; I _B = 100 μA dc;	V _{CE(sat)1}		0.3	V dc
Forward-current <u>6/</u> transfer ratio (gain ratio)	3076	V _{CE} = 5 V dc, I _C = 100 μA dc (see 4.5.4)	$\frac{h_{FE2-1}}{h_{FE2-2}}$	0.9	1.0	
Absolute value of base-emitter-voltage differential	3066	Test condition B; V _{CE} = 5 V dc, I _C = 10 μA dc (see 4.5.5)	V _{BE1} - V _{BE2} ₁		5	mV dc
Absolute value of base-emitter-voltage differential	3066	Test condition B; V _{CE} = 5 V dc, I _C = 100 μA dc (see 4.5.5)	V _{BE1} - V _{BE2} ₂		3	mV dc
Absolute value of base-emitter-voltage differential	3066	Test condition B; V _{CE} = 5 V dc, I _C = 1 mA dc (see 4.5.5)	V _{BE1} - V _{BE2} ₃		5	mV dc
Base-emitter-voltage (nonsaturated) (absolute value of differential change with temperature) <u>7/</u>	3066	Test condition B; V _{CE} = 5 V dc, I _C = 100 μA dc T _A = +25°C and -55°C (see 4.5.6)	ΔV _{BE1} -V _{BE2} ΔT _A ₁		0.8	mV dc
Base-emitter-voltage (nonsaturated) (absolute value of differential change with temperature) <u>7/</u>	3066	Test condition B; V _{CE} = 5 V dc, I _C = 100 μA dc T _A = +125°C and +25°C (see 4.5.6)	ΔV _{BE1} -V _{BE2} ΔT _A ₂		1	mV dc
<u>Subgroup 3</u>						
High temperature operation		T _A = +150°C				
Collector to base cutoff current	3036	Bias condition D; V _{CB} = 45 V dc	I _{CBO3}		2.5	μA dc
Low temperature operation		T _A = -55°C				

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 3</u> - Continued						
Forward-current transfer ratio 2N2919, 2N2919L, 2N2919U 2N2920, 2N2920L, 2N2920U	3076	V _{CE} = 5 V dc; I _C = 10 μA dc	h _{FE4}	20 50		
<u>Subgroup 4</u>						
Small-signal short-circuit input impedance	3201	V _{CE} = 5 V dc; I _C = 1 mA dc; f = 1 kHz	h _{ie}	3	30	kΩ
Small-signal open-circuit reverse voltage transfer ratio	3211	V _{CE} = 5 V dc; I _C = 1 mA dc; f = 1 kHz	h _{re}		1 x 10 ⁻³	
Small-signal open-circuit output admittance	3216	V _{CE} = 5 V dc; I _C = 1 mA dc; f = 1 kHz	h _{oe}		60	μmhos
Small-signal short-circuit forward current transfer ratio (magnitude h _{fe})	3306	V _{CE} = 5 V dc; I _C = 0.5 mA dc; f = 20 MHz	h _{fe}	3	20	
Open circuit output capacitance	3236	V _{CB} = 5 V dc; I _E = 0 100 kHz ≤ f ≤ 1 MHz	C _{obo}		5	pF
Noise figure	3246	V _{CE} = 5 V dc, I _C = 10 μA dc R _g = 10 kΩ, (see 4.5.7)				
Test 1		f = 100 Hz	F1		5	dB
Test 2		f = 1 kHz	F2		3	dB
Test 3		f = 10 kHz	F3		3	dB
* <u>Subgroup 5</u>						
Collector to emitter cutoff current	3041	Bias condition D; V _{CE} = 40 V dc	I _{CES}		20	nA dc
<u>Subgroup 6</u>						
Not required						
<u>Subgroup 7</u> <u>4/</u>						
Decap internal visual (design verification)	2075	n = 1 device, c = 0				

1/ For sampling plan see MIL-PRF-19500.

2/ For resubmission of failed subgroup A1, double the sample size of the failed test or sequence of tests. A failure in group A, subgroup 1 shall not require retest of the entire subgroup. Only the failed test shall be rerun upon submission.

3/ Separate samples may be used.

* 4/ Not required for JANS devices.

* 5/ Not required for laser marked devices

6/ The larger number shall be placed in the denominator.

* 7/ When using group A, subgroup 2 as electrical endpoints, this test is only required for JANS endpoints.

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TABLE II. Group E inspection (all quality levels) - for qualification only.

Inspection	MIL-STD-750		Qualification
	Method	Conditions	
<u>Subgroup 1</u>			12 devices c = 0
Temperature cycling (air to air)	1051	Test condition C, 500 cycles	
Hermetic seal	1071		
Fine leak			
Gross leak			
Electrical measurements		See group A, subgroup 2 and 4.5.8 herein.	
<u>Subgroup 2</u>			45 devices c = 0
* Intermittent life	1037	Intermittent operation life: $V_{CB} = 10$ V dc, 6,000 cycles.	
Electrical measurements		See group A, subgroup 2 and 4.5.8 herein.	
<u>Subgroup 3</u>			
Not applicable			
<u>Subgroup 4</u>			
Not applicable			
<u>Subgroup 5</u>			
Not applicable			

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

* 6.1 Intended use. The notes specified in MIL-PRF-19500 are applicable to this specification.

* 6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2).
- c. Packaging requirements (see 5.1).

* d. Lead finish (see 3.4.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers' List (QML) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center, Columbus, ATTN: DSCC-VQE, P. O. Box 3990, Columbus, OH 43216-5000.

* 6.4 Suppliers of JANHC die. The qualified JANHC suppliers with the applicable letter version (example JANHCA2N2919) will be identified on the QML.

JANC ordering information		
PIN	Manufacturer	
	43611	34156
2N2919	JANHCA2N2919	JANHCB2N2919, JANHCB2N2920
	JANKCA2N2919	JANKCB2N2919, JANKCB2N2920

6.5 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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Custodians:

Army - CR
Navy - NW
Air Force - 11
NASA - NA
DLA - CC

Preparing activity:
DLA - CC

(Project 5961-2444)

Review activities:

Army - AR, MI, SM
Navy - AS, MC
Air Force - 19, 99

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL**INSTRUCTIONS**

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-19500/355H	2. DOCUMENT DATE 14 August 2001
3. DOCUMENT TITLE SEMICONDUCTOR DEVICE, UNITIZED DUAL TRANSISTOR, NPN, SILICON TYPES 2N2919, 2N2920, 2N2919L, 2N2920L, 2N2919U, AND 2N2920U, JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) COMMERCIAL DSN FAX EMAIL	7. DATE SUBMITTED
8. PREPARING ACTIVITY		
a. Point of Contact Alan Barone	b. TELEPHONE Commercial DSN FAX EMAIL 614-692-0510 850-0510 614-692-6939 alan.barone@dscclia.mil	
c. ADDRESS Defense Supply Center Columbus, ATTN: DSCC-VAC, P. O. Box 3990 Columbus, OH 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman, Suite 2533, Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-6888	